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Cast Metal Plate for Closing Defect in Skull from Comminuted Fracture . . 158
William Rutledge Lipscomb, M.D. and Charles G. Grover, D.D.S.

The Management of Cardiac Patients Who Require Major Surgery (A Digest) 162
Herrman L. Blumgart, M.D.

Divinyl Ether: A Suitable Agent for War Surgery, *William I. Ogus, D.D.S.* . . 163

Factors in Correcting Jaw Position Relative to the Abnormal
Temporomandibular Joint, *Travis E. Kallenbach, D.D.S.* . . 166

Use of Face Bow and Gothic Arch Tracer in Immediate
Denture Construction, *Arthur A. Schweitzer, D.D.S.* . . 172

The Editor's Page . . 171

Notes on the Cuff . . 176

Dental Meeting Dates . . 184

Suggestions to Contributors . . 187

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CHARLES G. GROVER, D.D.S. (Colorado College of Dental Surgery, 1920) is co-author with Doctor Lipscomb of **CAST METAL PLATE FOR CLOSING DEFECT IN SKULL FROM COMMINUTED FRACTURE**, which represents brilliantly another example of the extension of services by the dental profession in collaboration with the medical profession. Doctor Grover has been a frequent contributor to the literature, exhibitor and clinician at society meetings. He is a member of the Colorado State Board of Health.

TRAVIS E. KALLENBACH, D.D.S. (Chicago College of Dental Surgery, 1926) continues his article on **FACTORS IN CORRECTING JAW POSITION RELATIVE TO THE ABNORMAL TEMPOROMANDIBULAR JOINT** in this issue. It was begun in February, continued last month, and will be concluded next month. The anatomy of this joint was discussed and illustrated in color in the February issue. Readers of the present installment are urged to go back to this color chart for reference.

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Cast Metal Plate for Closing Defect in Skull from Comminuted Fracture

WILLIAM RUTLEDGE LIPSCOMB, M.D. and CHARLES G. GROVER, D.D.S., Denver

DIGEST

The case reported here is unusual in that it is believed to be the first time that an impression of the living human brain has been taken and a metal plate cast in order to make a closure in the skull. The operative procedures are described.

Report of Case

History—The patient, a white woman, aged 31, suffered a comminuted fracture of the left fronto-parietal area of the skull on February 12, 1940. She was attacked by a sexual pervert who struck her with a hammer. The patient was unconscious for a short period, but was able to summon help when she regained consciousness. The police took the patient to the Denver General Hospital, where roentgenograms (Fig. 1) made of the skull revealed the large skull defect with bone fragments within the skull.

Examination—When the patient was examined, it was noted that she answered questions slowly but coherently, and complained of a headache, but otherwise appeared normal. The temperature was 97.2° F.; the blood pressure, 94 systolic and 62 diastolic; pulse, 96; respirations, 20. The emergency dressings were removed from the head which revealed a wound approximately 4 cm. in diameter in the left frontal region. From this wound was protruding macerated, hemorrhagic brain tissue.

Treatment—It was evident that a débridement was indicated immediately. The patient was taken to the operating room and given a general ether anesthetic. The hair was shaved over a radius of 10 cm.; the skin was



Fig. 1—Roentgenogram showing comminuted fracture of left fronto-parietal area, revealing bone fragments within the skull.

scoured with tincture of green soap and about 1 gallon of sterile water was poured over the area to rinse. After the wound was extended superiorly, there was adequate exposure of the solid bone surrounding the skull

defect. Fragments of bone were removed piecemeal from the macerated brain which was then removed by suction. When all the bone fragments and blood clots and macerated brain were finally removed, there remained

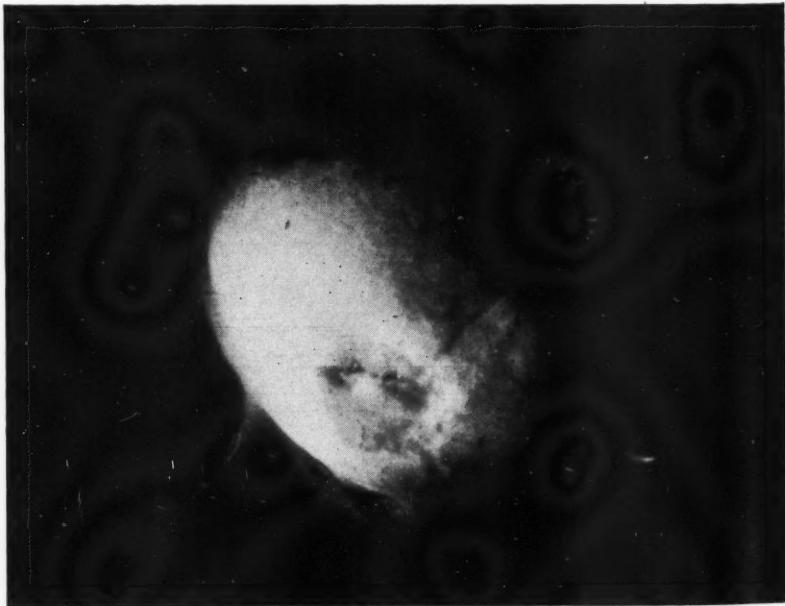


Fig. 2—Appearance before the first plastic operation.

in the frontal lobe a cavity of approximately 5 cm. in diameter. Hemostasis was accomplished with the electro-coagulator. All this having been accomplished, the brain displayed normal pulsations. The macerated, irregular skin edges were trimmed; the rough bone edges rounded; two penrose drains were placed deep in the brain cavity; the cavity was filled with salines; and the wound edges were approximated with silkworm gut; the head was bandaged.

Postoperative Course — The patient's convalescence was almost uneventful. She had a wound abscess which developed superficially and which was easy to drain. She was fortunate not to have developed more serious infection than this abscess inasmuch as the wound was primarily infected and at operation a piece of bone forming the roof of the left frontal sinus was removed from the brain. When the patient was dismissed from the hospital one month after the accident, the wound had healed completely; there were no objective abnormal observations and no subjective complaints except about a disfiguring scar and depression in the left side of the forehead.

Several months after the accident, the patient returned, complaining of the unsightly "hole in the forehead," about which she was asked embarrassing questions. Apparently she became depressed because of the disfigurement. She pleaded for anything that would obliterate the "hole."

At first the attempt was made to dissuade the patient about plastic repair, because in view of the previous infection, it was considered inadvisable to introduce foreign bodies necessary to mask the defect. Finally, when persuasion and reason were futile, a roentgenogram of the skull was taken and when this did not reveal osteomyelitis, we decided that with a two-stage plastic operation, it would be possible to take an impression of the brain and depression in the skull, cast a chromium-cobalt-molybdenum alloy (vitallium) plate which would give the proper contour

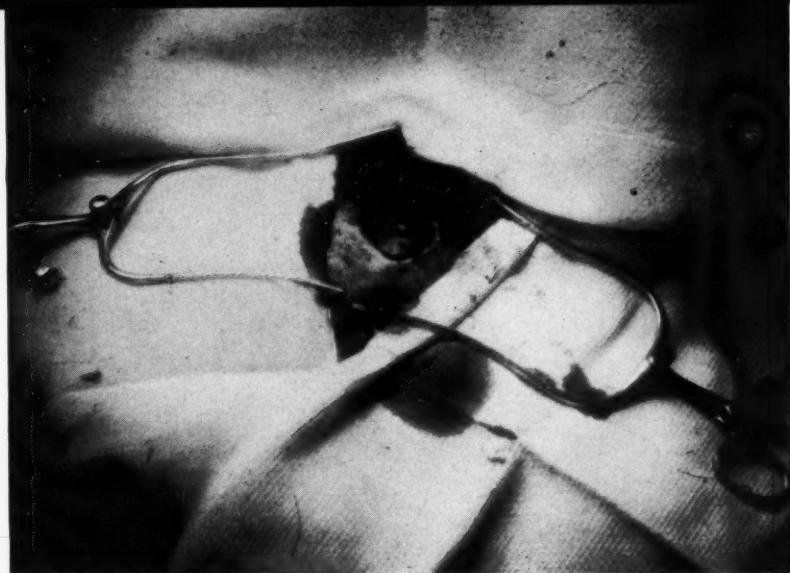


Fig. 3

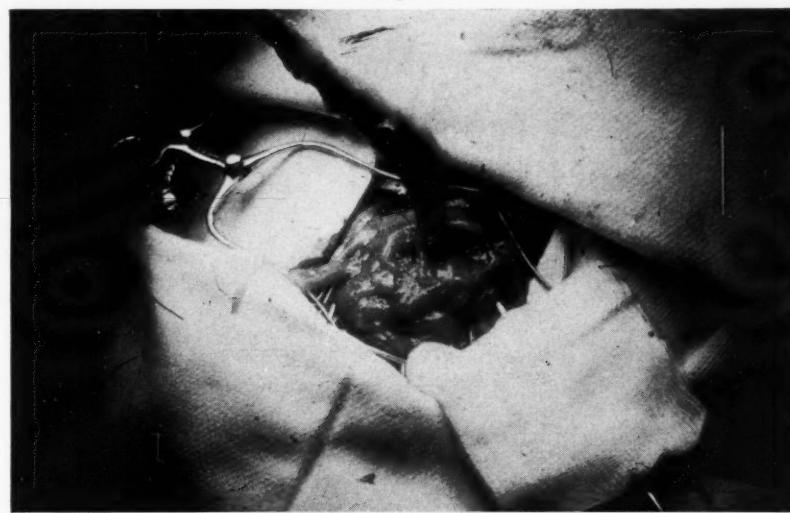


Fig. 4



↑ Fig. 5

Fig. 6 ↓

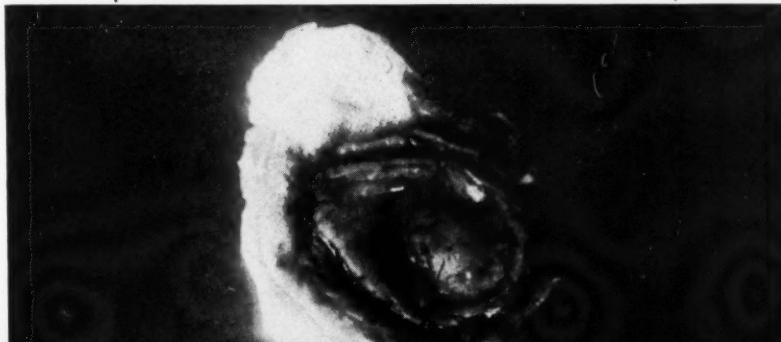


Fig. 3—Flap laid back showing the opening in the skull and brain.

Fig. 4—Painting the agar mixture for impression.

Fig. 5—Agar impression finished and ready to remove.

Fig. 6—Contact view of impression when removed.



Fig. 7

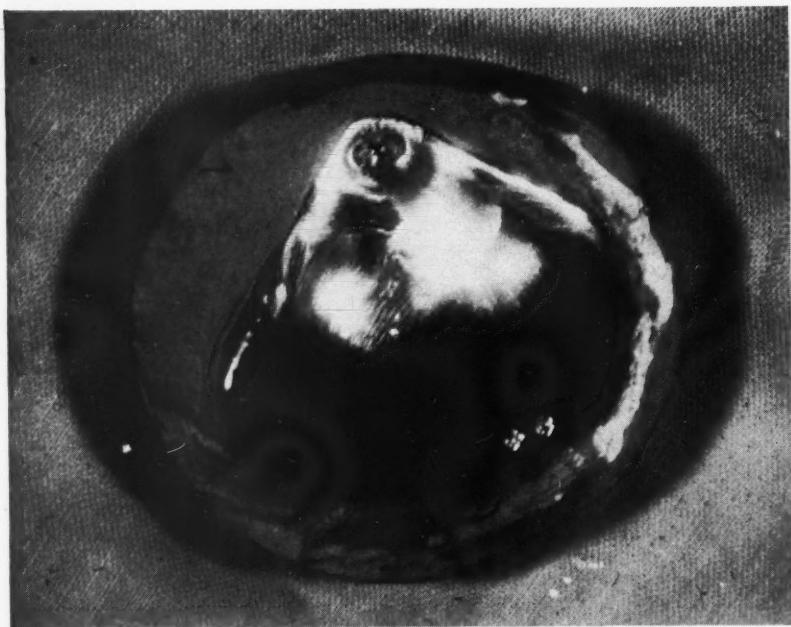


Fig. 8

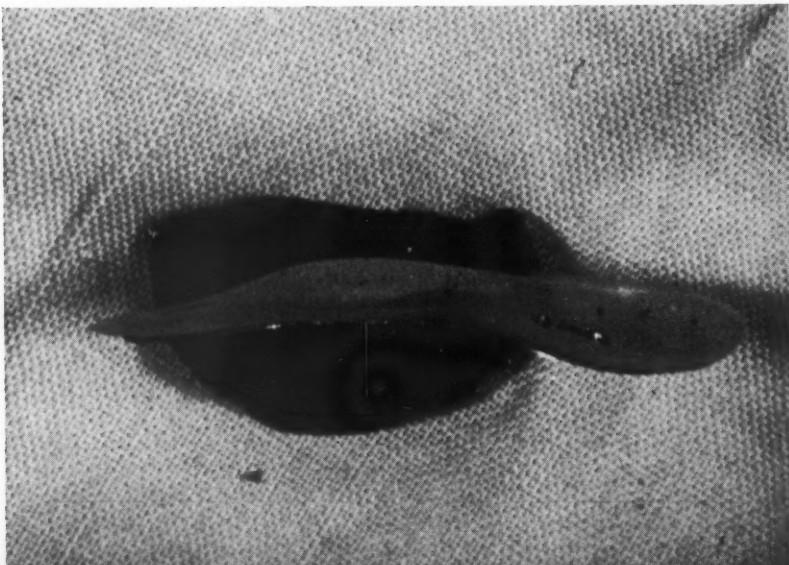
and at the same time have a definite seat without overlapping edges.

First Stage of Plastic Operation—1. On August 14, 1940, under general avertin and ether anesthetic, a horse-shoe-shaped incision was made about

1 cm. outside the bony edge of the defect with the hinge of the flap over the eye.

2. Two bony seats, one on the medial and one on the lateral edges of the defect were made for fixing the

Fig. 9



alloy plate which was to be made from the impression. Fig. 3 shows the opening in the skull and brain.

3. The impression was taken with distilled water, agar, magnesium sulphate, green soap and cellulose fibers. This mixture was prepared in a double boiler and then placed in the autoclave with the brushes, and sterilized.

4. When the impression material was taken from the autoclave, the inner boiler was placed in a second outer boiler which contained cold water. The impression material was then cooled to a temperature of 98.6° F. so as not to burn the brain tissue or bring about any rapid change of temperature. This mixture was then painted directly on the brain and built up over the edges of the opening in the skull. Figs. 4 and 5 show stages of taking the impression. As the agar mixture was applied, it was reinforced with sterile gauze.

Fig. 6 shows the impression as removed.

5. From this impression, a model was made. The center was waxed so as to give a concavity to the finished plate which would thus not come in contact with the brain; also, the concavity would make the plate thin. The case was outlined and waxed as for casting a denture base. Fig. 7 shows the model and under-surface of the plate.

6. Fig. 8 shows the plate on the model. It will be noted that holes were cast in the plate with the groove cast between them to accommodate wire so as to be flush with the plate. The contour of the plate was obtained by modeling to conform with the fronto-parietal region of the opposite side. Fig. 9 shows the edge view of the plate and the amount of contour necessary for esthetic effect.

Second Stage of Plastic Operation—On August 28, under general anesthetic, the flap was turned down and the chromium-cobalt-molybdenum alloy plate was fixed to the skull with two stainless steel wires. The wire

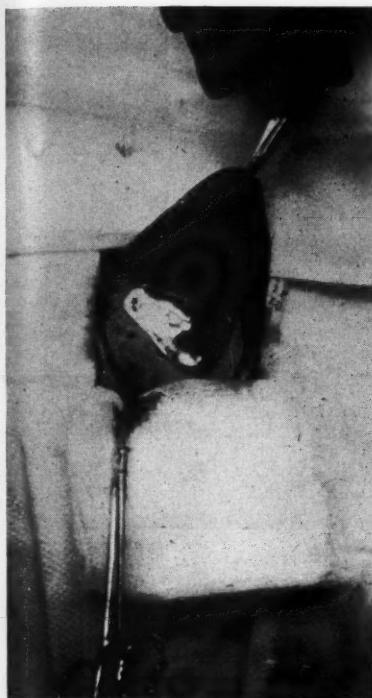


Fig. 10—Flap raised and plate in place.

was threaded through the plate, and through two small holes in the skull which had been made to correspond to the holes in the metal. The plate fitted perfectly in the bony seat and was difficult to dislodge even before wiring. The galea was approximated with chromic number 00 sutures and



Fig. 11—Incision sutured.

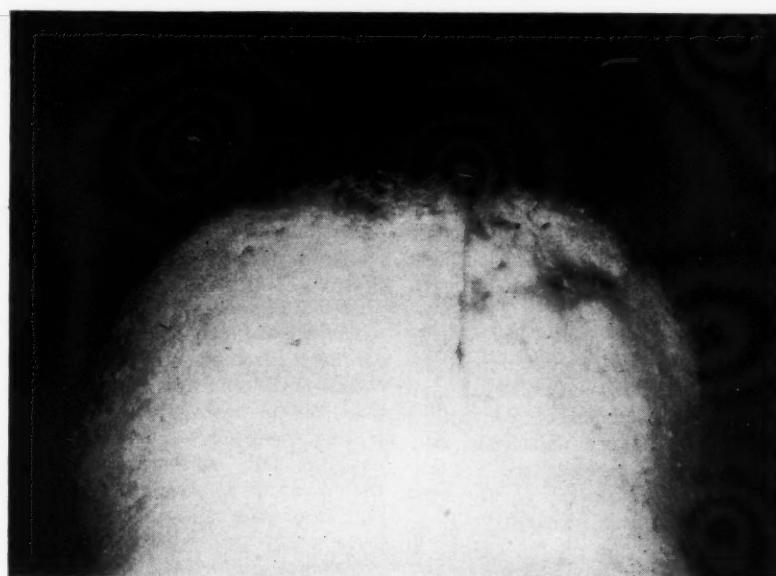


Fig. 12—Close-up on removal of sutures.

the skin with continuous silk. Fig. 10 shows the plate in place, and Fig. 11 shows the incision sutured.

Postoperative Course — The post-operative convalescence was uneventful. The wound was aspirated of 5 cc. of sero-sanguinous fluid on the second postoperative day. The wound edges healed by primary intention. All the stitches were removed by the fourth day and the patient was discharged from the hospital on the eighth day. There is no bony defect. Figs. 12 and 13 show the results on removal of sutures.

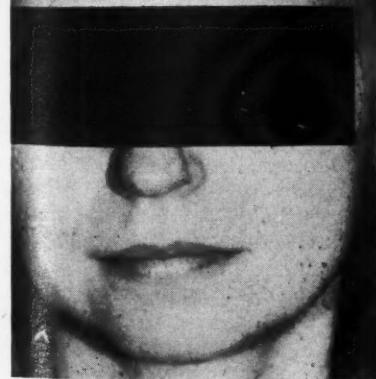


Fig. 13—Appearance on removal of sutures.

Comments

Because a foreign body was introduced into a previously infected wound this patient has been followed carefully. The most impressive feature outside of normal reactions with no indication toward slough or dissolution of tissues is the change of mental attitude. This patient acts like the extrovert she previously was; she is happy and working.

The roentgenograms of the skull, taken four months after operation, would indicate a good bony tolerance to vitallium (Fig. 14). There was no



Fig. 14—Roentgenogram showing from left to right: side view of plate; front view of plate, and appearance before inserting plate.

fluctuation over the plate; the operative scar was almost invisible; the traumatic scar was less pink. The two frontal bosses are symmetrical (Fig. 15).

Although two operative procedures

were necessary to accomplish this excellent result, they were worth while.

In war-time surgery the use of vitallium in cranial plastic surgery may have a top-ranking place.

Republic Building.

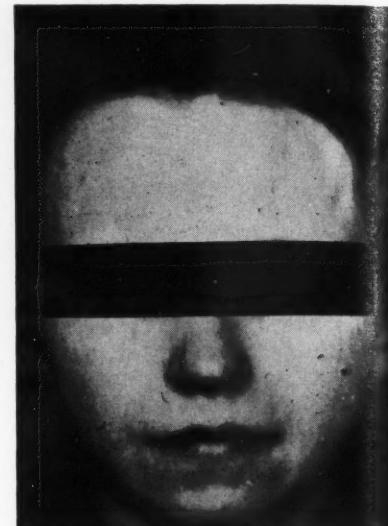


Fig. 15—January 1941. Scar is almost invisible, traumatic scar is less pink; the two frontal bosses are symmetrical.

THE MANAGEMENT OF CARDIAC PATIENTS WHO REQUIRE MAJOR SURGERY

HERRMAN L. BLUMGART, M.D., Boston

[New England Journal of Medicine, 223: 765 (November 7) 1940 and The Digest of Treatment 4:747 (April) 1941.]

THE DISTINCTION between heart disease and heart failure must be kept in mind. The added risk due to heart disease is generally proportional to the degree of decrease in the cardiac reserve. Preoperative treatment, however, may convert even those patients with gross evidence of congestive failure into less formidable risks. Bed rest is advised in such cases whenever possible for at least three weeks after complete subsidence of decompensation, however mild.

Rheumatic Heart Disease

In patients with mitral stenosis or other evidences of rheumatic fever, past or present, the reactivation of subclinical or latent rheumatic infection by operation or by accidents involving fractured bones or sprained joints has been observed.

Angina Pectoris or Healed Myocardial Infarction

The degree to which the increased hazard imposed by major surgery in obviously ill patients with angina pectoris or coronary arteriosclerosis can be reduced by skillful medical and surgical care is encouraging but

there should be no false optimism. The low incidence of fatality reported by Brumm and Willius resulted from careful preoperative study, judicious selection, expert administration of anesthetics and skillful surgery.

There is a high incidence of acute coronary thrombosis in diabetic patients. It is therefore wise for the physician to warn surgeons contemplating operation on older diabetic patients, both men and women, of the possibility of precipitating an attack of coronary thrombosis and the importance of preventing shock or a fall in blood pressure from any cause. The dangers of hypoglycemia in precipitating acute myocardial infarction is emphasized.

Preoperative and Postoperative Management of Cardiac Patients

Sedation—The preoperative use of barbiturates, such as phenobarbital in $\frac{1}{4}$ or $\frac{1}{2}$ gr. doses 3 or 4 times daily to lessen apprehension and its effects on the cardiovascular system has won widespread adoption. Larger doses may be dangerous.

Body Fluids—No specific routine can be followed in respect to the administration of fluid in cardiac patients. The observations on physical

examination, the amount of perspiration, the amount of urinary output and the subjective degree of thirst experienced by the patient are important guides in deciding the amount of fluid to be administered.

Digitalis—The almost routine digitalization of patients over 50 has received diminishing acceptance.

Anesthesia—The anesthetist is to be considered as a consultant rather than as a technician and should participate in discussions of the particular problems offered by the individual patient. The use of a high percentage of oxygen with the inhalation of anesthetics is advantageous. Nitrous oxide anesthesia is particularly hazardous in cardiac patients for operations of long duration because of the frequency of anoxia. The danger of a fall in blood pressure, particularly in patients with marked hypertension, should be kept in mind.

Oxygen—Prophylactic oxygen therapy should be considered after operation in all cases in which the cardiac reserve is limited.

Nitroglycerin—The prophylactic use of nitroglycerin has not been so widely utilized as it deserves. Preoperative medication of 1/500 gr. under

(Continued on page 184)

Divinyl Ether: A Suitable Agent for War Surgery

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DIVINYL ETHER IS a rather new development as an anesthetic agent. It is classified with the 100 per cent potent drugs, such as ether, cyclopropane, ethyl chloride, and chloroform. Its administration is either by open drop technique or as a vapor through gas machines. Induction is from thirty seconds to one minute. Recovery is almost immediate. The same care is taken to prevent burns to the face as when ether is used—by applying cold cream or oil.

In the report by Chauncey Leake,¹ injury to the liver is noted when dogs are anesthetized for long periods, but for a short-duration anesthetic, up to one-half hour, this objection is entirely eliminated.

Indications for Use

Removal of débris from wounds, application of painful dressings, removal of sequestrums, extraction of teeth, reduction of fractures, preparation of sensitive cavities—these are some of the important applications of divinyl ether (vinethene) which should make this anesthetic particularly suitable for war surgery.

Arthur Guedel² writes, "Vinethene would be particularly applicable in army and navy practice. It is potent, not unpleasant, fast in and out and convenient to use. In the husky soldier and sailor, the liver damage reported in dogs would be of but little consequence. I believe, were I asked to look after the anesthesia in field or evacuation hospitals and, even in some base hospitals, I would select vinethene as the agent of choice."

During the last year divinyl ether (vinethene) anesthesia has been used in the Dental Corps almost every day and on no single occasion has the choice been regretted. It has been found to be suitable for more varied procedures than was thought possible

DIGEST

Vinethene is recommended as an anesthetic agent for war surgery because of its portability, ease and convenience of administration, rapidity of action, and usefulness in emergency surgery. Methods of administration have been described and dosage limits suggested.

a year ago. Failures mentioned in earlier reports were doubtless due to a faulty technique of administration. When properly administered, unconsciousness occurs with remarkable speed.

Characteristics

With delicate handling the anesthesia may be balanced just above the excitement stage and, although the patient may be stuporously conscious, he remains imperceptible to pain when painful dressings or drains are removed, when abscesses are

opened, or fractures are reduced. From such a perfectly administered analgesia, complete recovery with perfect orientation follows within less than sixty seconds. The usual induction takes from thirty seconds to one minute. Relaxation is fairly good. Complete risk is eliminated if the patient can be controlled in analgesia; no deaths have ever occurred when a patient was not asleep.

Divinyl ether (vinethene) is not irritating to the respiratory tract; it does not cause an undue increase of secretions; in fact, it produces little more secretion of saliva than does nitrous oxide or ethylene, and considerably less than ether.

In emergency war surgery it is not likely that patients will often have a full stomach. Rolling kitchens and the Service of Supply never catch up during battles, for battle-chow is not delicate and quickly digestible, and furthermore, emptying of the stomach is inhibited and may be delayed for many hours by emotions under battle conditions. Vinethene, however, has been administered to unprepared patients on many occasions and to patients who had recently eaten. The remarkable rarity of vomiting, or

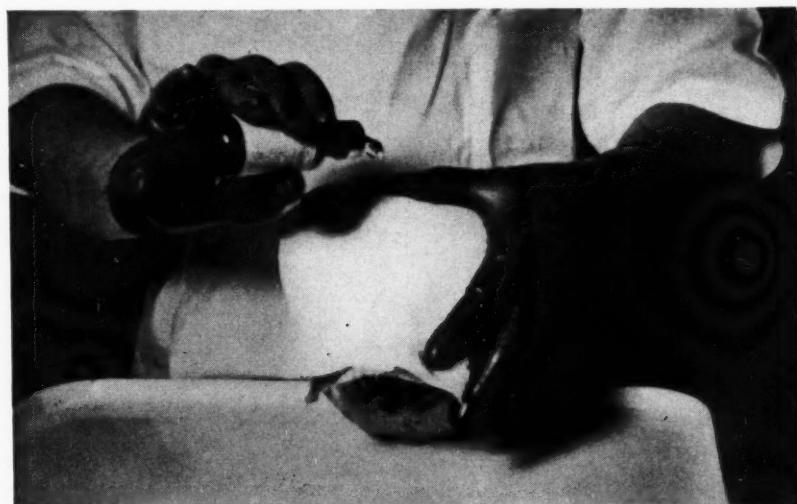


Fig. 1—Eight thicknesses of gauze covering face. Divinyl ether is applied with dropper attachment—from 50 to 60 drops per minute.

¹Leake, Chauncey: A Preliminary Note on the Anesthetic Properties of Certain Unsaturated Ethers, *Anesth. & Analg.* 10:1-3 (January-February) 1931. The Rôle of Pharmacology in the Development of Ideal Anesthesia, *J. A. M. A.* 102:1 (January 6) 1934.

²Guedel, Arthur: *Inhalation Anesthesia*, New York, The Macmillan Company, 1937.

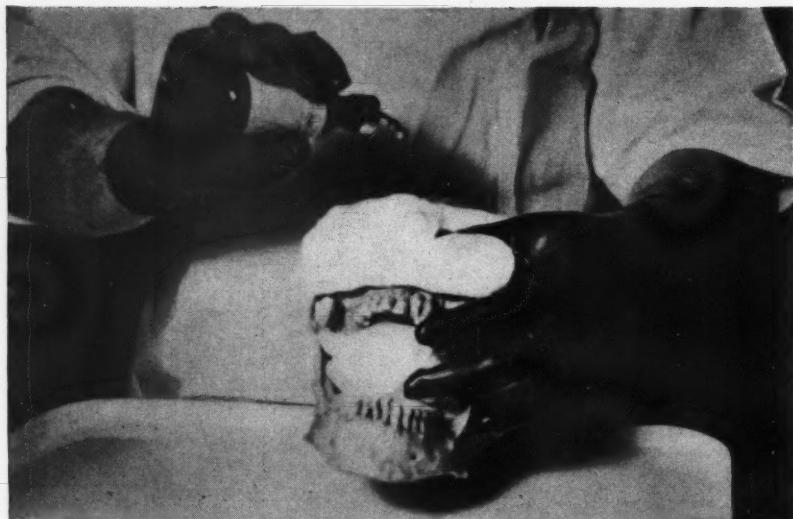


Fig. 2—Gauze is doubled to expose mouth and surrounds nose. Dropping at same speed is continued and mouth pack placed after 5 or 6 drops are applied on mouth pack.



Fig. 3—Operator beginning anesthesia.



Fig. 4—Assistant continuing anesthesia while operator removes teeth.

even of nausea under these circumstances is better than anything obtained, in our experience, with other agents. Vinethene is not ordinary in this respect, and has particular usefulness under these conditions.

For speed of induction as well as of recovery, it is second to no other agent that depends on the circulation for its distribution and elimination. Vinethene has also been found useful for the induction of ether anesthesia. For the patient it eliminates or reduces to a minimum the sensations of suffocation and irritation which are produced by ether anesthesia. In the course of an open ether induction a tormented patient has often been heard to plead, "I cannot breathe; take it away. Just let me have one breath of air!" It is possible to begin the administration of vinethene slowly (from 20 to 30 drops per minute) without increasing the rate of administration to 50 or 60 drops per minute until the olfactory nerves have been numbed, and the patient is unaware of any mental or bodily suffering. As a rule unconsciousness is thus effected in from forty to fifty seconds. Although excitement may occur during the second stage of an induction with any anesthetic, the incidence of excitement has been so low as to be almost negligible when divinyl ether is used.

Convenience

Convenience of administration under war conditions may assume an importance overshadowing other considerations. Simplicity of administration may also be greatly essential for war anesthesia. Because the anesthetic is easily portable and requires no additional apparatus other than a simple open cone or a gauze sponge, or even in an emergency, a handkerchief, upon which to vaporize the anesthetic, I am convinced that vinethene will take its place close to the front line in war surgery.

Administration

In order to use vinethene well one must acquire at least a little experience in administering it. One should be thoroughly familiar with the reactions that may occur and be able to recognize the signs of anesthesia caused by divinyl ether, especially those signs which distinguish this anesthesia from that produced by other anesthetic agents. It is of utmost importance that the proper

technique of administration be employed so as to prevent disappointing failures. Such failures do not occur when the anesthetic is correctly administered.

Early failures with vinethene were due to giving too little vinethene or to administering it too slowly. Somewhat later, the anesthetic was administered too fast, or too much gauze was used upon the mask with the results that the first anesthetics were uneven, and on several occasions mild apnea occurred during an induction. On the first occasion this caused me considerable concern but it no longer does, because by simply removing the mask, it is possible to start respiration by a little pressing on the chest of a sort that can hardly be called artificial respiration. This maneuver is not listed as a resuscitation, for recovery will follow if the administration is discontinued and a few minutes are allowed for distribution of the highly concentrated but small dose that produces the apnea. There seems to be no drawback in having apnea occur during the induction of anesthesia; moreover, apnea is not followed by any appreciable ill-effect. On the other hand, one should not be guilty of reckless administration of an overdose during the maintenance period.

No more considerable skill is required to recognize the signs of deep and deepening anesthesia which forewarn of overdosage or respiratory arrest produced by vinethene than with other agents that are capable of producing such deep anesthesia; however, one should always remember the comparative rapidity with which vinethene will take a patient from consciousness to the fourth stage.

It is my impression that vinethene has never been associated with a death during administration, unless perhaps when a death occurred during brain surgery, although Shipway³ did mention a death in a nursing home of which he had knowledge and of which he says, "A death from asphyxiation following overdose was reported from St. Mary's Hospital in 1934." Should the misfortune of administering an overdose occur, the anesthetic should be immediately discontinued and oxygen administered.

Vinethene blends well with nitrous



Fig. 5—Extraction completed. Mouth pack is moved over wound. Patient is instructed to close teeth for pressure to aid blood clot which will remove danger of contamination.

oxide-oxygen and this combination produces anesthesia that more closely simulates the anesthesia produced by cyclopropane than any other combinations of anesthetic agents that we have investigated. It is far superior to nitrous oxide-oxygen and ether. The speed of induction with vinethene is comparable to the speed with nitrous oxide and recovery is nearly as prompt; whereas with ether in the mixture the anesthesia becomes predominantly an ether anesthetic with characteristic post-anesthesia depression and slow recovery.

Quiet, rhythmic respiration ushers in an anesthesia consummate for the change to ether which may be effected with amazing smoothness. A point to be borne in mind is the remarkable speed with which the anesthesia is lost when vinethene is discontinued. This rapidity, however, is a common cause of failure, for once vinethene administration is stopped, anesthesia must depend on the diffusion of ether which is relatively slow and which requires an appreciable interval. It seems advisable, therefore, to continue vinethene until an anesthetic concentration of ether reaches the brain.

One essential in vinethene anesthesia is to maintain a 20 per cent concentration of oxygen in the mixture of anesthetic gases. The depth of anesthesia may be controlled by varying the concentration of vinethene. Only if this is strictly adhered to is the possibility of cyanosis and of asphyxia prevented. Induction is quiet

and any desirable degree of relaxation may quickly be attained. Provided premedication has not been excessive, recovery will promptly follow withdrawal of the anesthetic. In addition there is a saving of nitrous oxide, and as reported by Rothwell,⁴ little vinethene is used. The closed method is, of course, the most economical and the open drop is the most wasteful, especially in hot weather or at high altitudes. No more than from 50 to 75 cc. of vinethene should be administered by the open drop method at one time.

The limit of the quantity administered is an additional safeguard which is as important in describing the safe dose as is the time limit of half an hour which the Council on Pharmacy and Chemistry of The American Medical Association has set for vinethene.⁵ In determining the effect of an anesthesia on a patient, not only the length of time but also the depth of the anesthesia must be considered. A light anesthesia for a relatively long time is less shocking to the patient than a deep anesthesia for a shorter time. Although there is a wide variation to the quantity of vinethene which is required for different persons for comparable anesthesias, it has been observed that 50

(Continued on page 175)

⁴Rothwell, B. S.: Vinethene, *The Military Surgeon*, 86, number 5 (May) 1940.

⁵Ogus, W. I.: Vinethene, *The Military Surgeon*, 87:301 (March) 1941. Lyons, S. S.: Vinethene Analgesia, *J. A. D. A.* 26:580 (April) 1939. Cameron, J. R.: Selecting a Suitable Anesthetic Agent for Exodontia and Oral Surgery, *Anesth. & Analg.* 18:278 (September) 1939.

³Shipway, F. E.: Vinethene, *British M. J.* 1:70 (January 12) 1935; *Lancet*, 1:82 (January 12) 1935.

Factors in Correcting Jaw Position Relative to the Abnormal Temporomandibular Joint*

(Third Installment)

TRAVIS E. KALLENBACH, D.D.S., St. Louis

DIGEST

It is believed that if any abnormal case can be studied, properly diagnosed and visualized in its abnormal state, an image of its correction can be formed. With the knowledge of salient factors, the operator may select a starting point that is common to normal and abnormal cases alike. Such a starting point is the neutral rest zone—the only logical starting point when seeking to position or reposition the mandible correctly, because its limits are common to normal cases alike. It is in the neutral rest zone that the mandible is positioned during the completest muscular rest. It is the zone in which there is no muscular effort exerted and consequently, no function takes place. It is the zone from which all muscular action and function begin following an interval of rest. And it is to this zone that the mandible returns for rest as a safeguard against fatigue after muscular effort and function. In this zone there is probably the most perfect

muscular coordination and balance while the muscles in their most relaxed state are merely supporting the weight of the mandible.

After the procedure has been determined whereby the case will be corrected so as not to perpetuate the abnormality, there remains the mechanical and technical procedures of restoration. In this, it is essential to keep in mind that the entire jaw mechanism is a splendidly coordinated unit. Reexamination of many "complaint" cases has revealed evidence of perpetuation of a deformity, technical skill notwithstanding, because a temporomandibular joint abnormality was not recognized, although muscular unbalance and shortened vertical dimension should have been the clue to make further investigation.

Along with the mandibular neutral rest zone is a temporomandibular joint rest zone, about which the same comments might be made. No stress is applied on joint structures while the mandible is positioned in this

rest zone; no function begins until mandibular action starts.

Regions beyond the normal limits of the neutral rest zone are primarily four and are referred to as functional regions: upper, anterior, lower, and posterior. The first three permit a wide scope of mandibular movement. The fourth is limited in scope and function, acting only as a shock-absorber for the mandible. The fourth or posterior region is of most concern during correction because it more than any other is altered in abnormal cases.

Registrations or observations made with the neutral rest zone as a normal starting point will not be distorted by muscular unbalance, unbalanced occlusion, an abnormally retruded position of the condyles, abnormal or "habit" mandibular movement, because there is no muscular action to propel the mandible.

Securing proper vertical dimension is an essential factor in determining the normal limits of the neutral rest zone.

MANY DIVERSE OPINIONS have been stated and many confused terms have been used to explain and determine the reasons why some patients return to the dentist's office disappointed, dissatisfied and complaining of no relief from distressing and even pain-

ful symptoms following technical and mechanical procedures that have been skillfully executed. The operator is at a loss to determine where he failed and at what point in the procedure he probably erred. It is believed that most of these cases would

show, on reexamination, the perpetu-

*Kallenbach, T. E.: Factors in Correcting Jaw Position Relative to the Abnormal Temporomandibular Joint, First Installment, DENTAL DIGEST, 47:66 (February); Second Installment, 47:108 (March) 1941. Conclusion: Next Month. Readers are urged to consult the colored chart of the anatomy of the temporomandibular joint which appeared in the February installment.

ation to some degree of an abnormal jaw position and abnormal temporo-mandibular joint articulation.

That a dentist would operate on a case as normal without even suspecting a temporomandibular abnormality and a shifted jaw position is not unthinkable. It seems to be routine to consider all cases within the realms of normality whether dentulous or edentulous. There has in the past been little tangible information available to lead to a correct differential diagnosis and dental correction of jaw position relative to the temporomandibular joint.

Fortunately for the patient and the dentist, the key position of the mandible which is of the greatest value in diagnosis is never destroyed or altered except in rare cases. I mentioned in a previous installment that the pa-

tient could show this key position to the dentist more easily and accurately than he in any way could determine it himself. It is the most normal position of the mandible and remains the most normal with respect to its relation to the maxillae, when all movements might have become abnormal. It is a position at which muscular coordination is always reciprocal and synchronized so as to produce muscular rest; where no muscular strain or effort is felt by the patient, and where there is no strain exerted on the structures of the temporomandibular joint.

At the so-called "rest position" or "neutral zone," the mandible is suspended limply without occlusal contact, just as the arm is when hanging beside the body; it might be said that each is dangling in a neutral zone

waiting to go into action. A rest or neutral position occurs in the temporomandibular joints simultaneously with the mandibular rest position, and, as mentioned before, no joint trauma exists while the joint rests in this zone. It is a zone of muscularly coordinated rest in which nothing happens but from which everything begins to happen—the normal and abnormal alike. From this zone begins all joint action and movement simultaneously with mandibular action and movement (Figs. 1 and 2).

When a stimulus is applied to the abductor muscles to open the mouth, the mandible leaves the neutral zone downward. It leaves the upper limits of the zone at the moment it contacts an interposed object that forcibly resists it while moving upward, as for example, by the opposing teeth dur-

Fig. 1—Normal dimensional proportion of the neutral rest zone in the incisor region, approximately from 3 mm. to 4 mm. It represents a zone of muscular rest provided by Nature to safeguard against fatigue and usually remains normal despite wear and tear on teeth and joints. A: Functional region upward beyond normal upper limits of neutral rest zone. It is increased abnormally upward by loss of vertical dimension. B: Functional region downward beyond normal lower limits of neutral rest zone into which mandible moves downward and forward when teeth are separated farther apart, preparatory to biting or singing, for example. C: An object interposed between teeth in neutral rest zone. Contact of lower teeth with object, as in biting, stimulates muscular action, thus eliminating neutral rest zone as mandible is propelled through its upper limits. If upper denture, natural or artificial, were supposedly lengthened abnormally by thickness of interposed object, the vertical dimension of neutral rest zone would be abnormally reduced to its lower half and its upper limits lowered abnormally to center of zone.

Fig. 2—Position of anterior teeth relative to normal limits of neutral rest zone. A: Incisal edges (unabraded) in normal position with respect to upper and lower limits of neutral rest zone. B: Incisal edges of lower teeth resting at about the center of neutral rest zone. C: Incisal edges of lower teeth at anterior and upper limits of rest zone. Function begins beyond upper limits of rest zone at this point. D: Position of lower anterior teeth at lower and normal posterior limits of neutral rest zone. Dotted lines position shows outline by contrast with what may be called normal anterior and posterior limits of neutral rest zone at its lower limits. E: Position during function beyond lower limits of neutral rest zone as represented by region B in Fig. 1. F: Abnormal increase in regions beyond anterior and posterior limits of neutral rest zone upward and backward as a result of shortened vertical dimension in posterior dental area, loss of molars (one side or both, and with dentures when teeth are set "too short.")

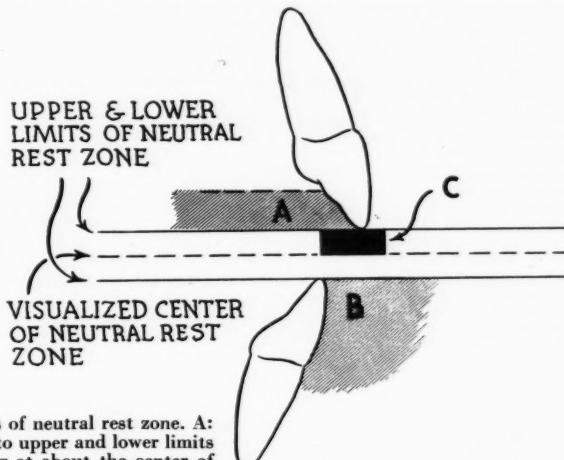


Fig. 1

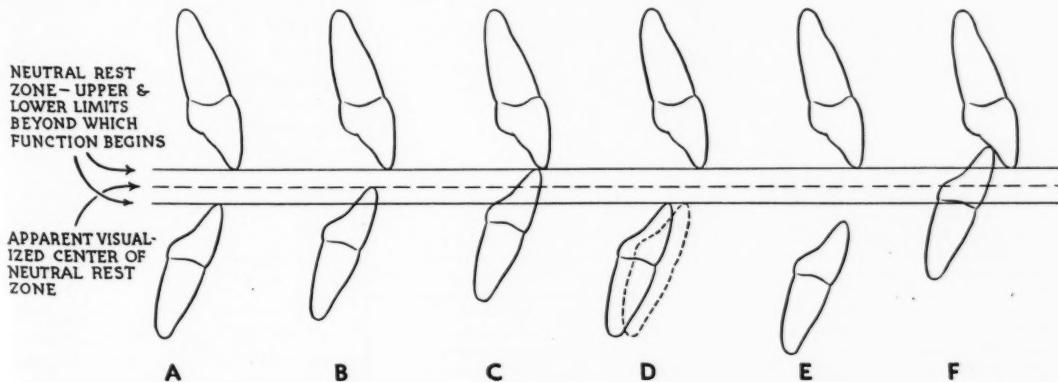


Fig. 2

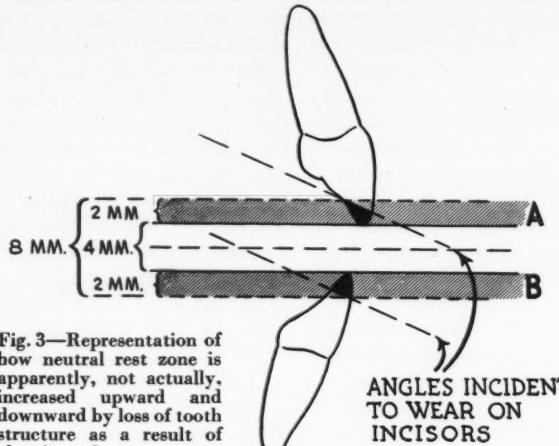


Fig. 3.—Representation of how neutral rest zone is apparently, not actually, increased upward and downward by loss of tooth structure as a result of abrasion; 2 mm. upper plus 4 mm. rest zone plus 2 mm. lower equals 8 mm. total. Black areas represent loss on incisal edges by abrasion. Shaded area, A, represents 2 mm. loss abnormally upward beyond upper limits of rest zone and B represents 2 mm. loss downward beyond its lower limits. The mandible must consequently travel the additional 4 mm., a total of 8 mm., to make incisal contact.

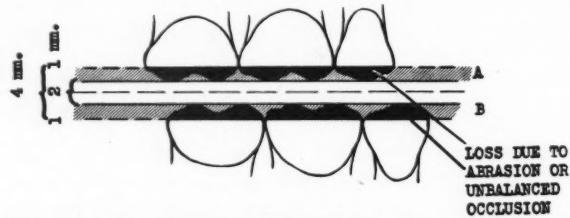


Fig. 4.—Molar region accompanying anterior region as shown in Fig. 3. Neutral rest zone shown as normally from 1.5 mm. to 2 mm. in molar region as compared to 3 mm. to 4 mm. in incisal region. Areas A and B are represented proportionately with A and B respectively in Fig. 3. Abnormal increase in path of mandible upward to molar contact is thus 2 mm. approximately or a total of 4 mm. as indicated.

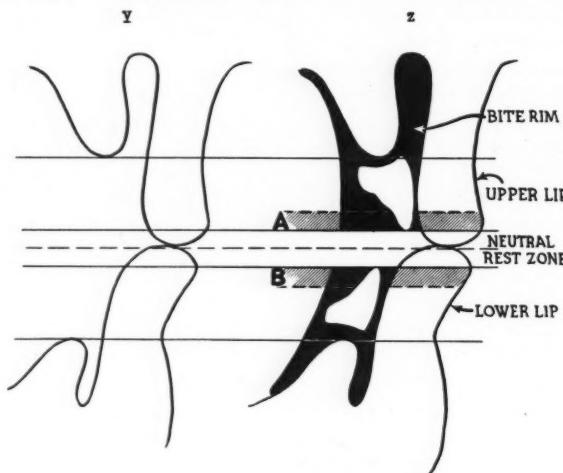


Fig. 5.—Dimensional comparison of an edentulous case with the dentulous. Compare with Figs. 1 and 3. Y represents position of mandible in neutral rest zone without baseplates and rims. Z shows the baseplates and rims in place to reproduce the neutral rest zone. If bite rims were shorter by a total of 4 mm., 2 mm. upper and 2 mm. lower, as represented by shaded areas A and B, the jaw position would be displaced upward and backward abnormally, the region posterior to posterior limits of neutral rest zone would be encroached upon and the condyles would be functioning in an abnormally retracted position in the fossae.

ing deglutition or by something held between the teeth; consequently, the neutral zone is eliminated during muscular stimulation as in biting, swallowing, mastication, or singing. During these actions the mandible is forcibly propelled through the neutral zone in variable directions as the case may be, instead of resting in it.

The anterior-posterior limits of this zone are equally as important as the vertical limits. The anterior limits are reached when the labio-incisal edges of the lower anterior teeth touch and meet the lingual surfaces of the upper anterior teeth near the incisal edges in the case of normal vertical dimension; the mandible "dangles" forward or at a position simulating a slightly posterior edge-to-edge relationship of the anterior teeth in cases of shortened vertical dimension. The posterior limits are reached when the slightest muscular effort begins and is discernible by the patient as the mandible travels backward. At this moment the patient will also feel pressure against the posterior wall of the temporomandibular fossae exerted by the condyles. It is well to note here that by conscious effort the mandible can be forced backward into the region posteriorly beyond the posterior limits of the zone from 0.5 mm. to 3 mm. In normal cases from 0.5 mm. to 1 mm. is usually the maximum. The backward range of this region is increased up to 3 mm. or 4 mm. abnormally, depending on the degree of destruction in the joints and looseness of the joint capsule and ligaments. If this position is held (teeth not in contact) for as little as 30 seconds, compression of joint structures, quick muscle fatigue, and collapse of the eustachian tube can be detected. Nature has provided a safeguard for the temporomandibular joints by extending this region posterior to the neutral zone to be a shock absorber. By extending the mandible forcibly backward, from 1 mm. to 3 mm. is gained only by compressing the "shock absorbers." Normally this region is not utilized during mastication. It serves only as a cushion against which the mandible makes contact during its excursions and bounces away (Figs. 3 and 4).

It may be readily seen that with the neutral rest position as a zone from which all mandibular and joint action starts, only three regions beyond the limits of the zone are utilized functionally during mandibular

movement. They are: the upper, lower, and anterior regions. The mandible moves away from the neutral zone into the surrounding area designated by these three regions during mastication.

The fourth region, the posterior, is the most limited in its scope and function inasmuch as it serves only as the shock absorbing protection device to safeguard against trauma, injury, and excessive wear and tear on the joint tissues. Normally, it assists in preventing the condyle from traumatizing the posterior wall of the mandibular fossa. When the posterior region is enlarged or increased by wear and tear, injury, and destruction in the temporomandibular joints, it loses a great deal of its protective function and permits abnormal movement of the mandible posteriorly.

It is this region more than any other that concerns dentists in correction, because the most distressing symptoms are produced in the patient as the mandible moves abnormally backward and upward into the posterior and upper regions beyond the limits of the rest zone, during mastication and swallowing, for example. (Clinical manifestations that permit this condition were given in the previous installment last month.)

It may be understood more clearly now why the Gothic arch tracing that is registered during mandibular movement and muscular effort is not reliable even in normal cases; namely, because the mandible invades this enlarged sphere of unintended activity posteriorly and thus registers abnormal posterior position and muscular unbalance on the tracing by its abnormal posterior activity. It is, moreover, obvious why the so-called bite should not be taken with the condyles in their most retruded position, under stress, nor during mandibular movement. I believe, therefore, that the only logical method of obtaining a normal registration of jaw position, uninfluenced by mandibular movements, abnormal and "habit" jaw positions in both normal and abnormal cases, is to secure the registration in the neutral rest zone which is certain to remain normal under all conditions.

The only important differing factor, then, between the edentulous and the dentulous cases is the absence of teeth, which in the dentulous case aid in determining the degree of loss of vertical dimension.

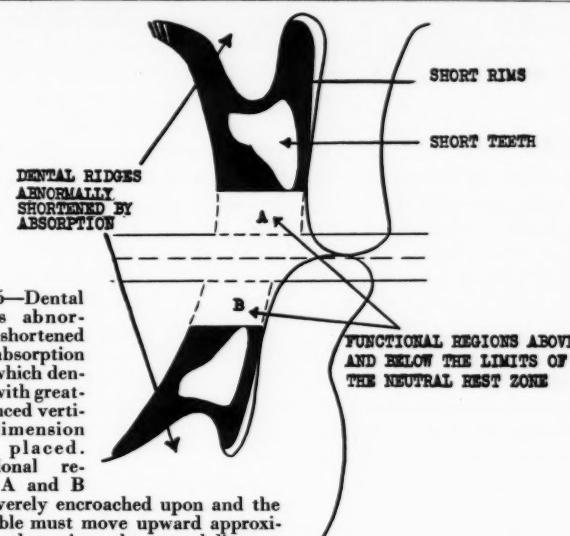


Fig. 6—Dental ridges abnormally shortened by absorption upon which dentures with greatly reduced vertical dimension are placed. Functional regions A and B are severely encroached upon and the mandible must move upward approximately three times the normal distance to make occlusal contact. Dentures constructed according to such errors are often seen to cause temporomandibular abnormality and painful symptoms, as well as distorted facial expression. Subluxation in joints and severe condyle thrust follow and erosion of tympanic plate and superior surface of fossa begins. If the case was abnormal to start with, it has thus been continued in its abnormality.

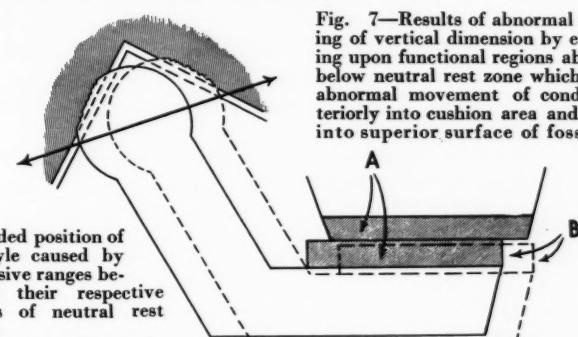


Fig. 7—Results of abnormal shortening of vertical dimension by encroaching upon functional regions above and below neutral rest zone which permits abnormal movement of condyle posteriorly into cushion area and upward into superior surface of fossa. Note retracted position of condyle caused by excessive ranges beyond their respective limits of neutral rest zone. Arrow indicates abnormal condylar path resulting from lack of occlusal support, muscular unbalance, loosened capsule and ligaments. Note worn surface of condyle and fossa. A: Abnormally retracted position of teeth or bite rims with mandible in an abnormally retracted position. B: Abnormally anterior position of teeth or bite rims with eroded condyle resting in injured superior surface of fossa. In a subluxated position, which is so often seen, the condyle drops downward to permit further protraction of mandible.

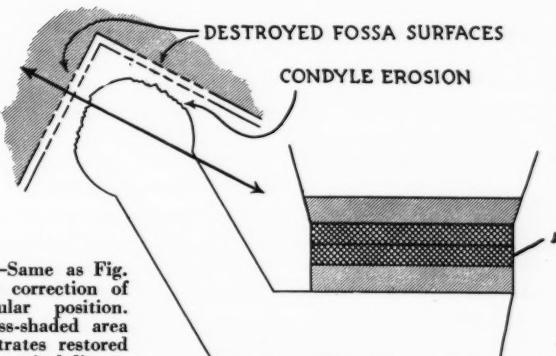


Fig. 8—Same as Fig. 7 after correction of mandibular position. A: Cross-hatched area demonstrates restored area of vertical dimension (either on teeth or by splints acting as jacks to support mandible in downward and forward position to prevent encroachment on superior and posterior surfaces of fossa by condyle. Arrow shows restored normal direction of condylar path movement. Shaded area shows short bite rims, abraded teeth or loss of them. Note anterior posterior relation of mandible. Note normal position of condyle.

Discussion of Technique

(Figs. 5 and 6)

1. The first step, therefore, in the technique of securing a normal positional relation of the mandible to the maxillae for the normal and abnormal cases alike, is carefully to construct the vertical dimensions of the upper and lower baseplates, so that with the mandible reposing at the lower limits of the neutral rest zone, not more than from 3 mm. to 4 mm. of space will exist between the rims anteriorly.

2. The occlusion of the rims is checked carefully, so that when there is the slightest contact possible by upward movement of the mandible, there will be no irregularity on the faces which will start muscular action and jaw movement.

With this carefully executed, the occlusal plane of the upper rim simulates the upper limits of the neutral rest zone, and the occlusal plane of the lower rim, the lower limits. No attention need be paid to the anterior and posterior limits so long as the mandible remains in the neutral rest zone, because they then remain normal.

At this point, then, the harmony and balance of the unit at rest are identical with the most normal mechanism at rest. It is only when function begins that the former would show abnormal function and the latter, normal function. But, for the time being, we are entirely unconcerned with function.

3. With a hot instrument, the wax rims are sealed together while the lower rim approximates a position close to the upper, preferably not in contact. Care must be exercised not to start mandibular movement reflexly by any pressure. Other means, such as soft plaster between or around the rims have served all right at times, but such application is more apt to stimulate reflex movement.

4. The rims are removed, replaced on the casts, and mounted on any kind of an articulator. Intricately designed "functional" articulators do not permit the adjustment to compensate for the variables that are so individual to a more intricate mechanism—the human jaw. The registration of the mandibular position was made in the rest zone where no functional movement exists; hence, no functional movement is necessary on the articulator, because the tooth arrangement should also be established

in accordance with this nonfunctional zone. In the words of Ruppert Hall, "After you learn to set up teeth, you can set them on a barn door hinge."

5. Any acceptable method of tooth arrangement will suffice, however, because the set-up is to be checked in the mouth to see whether neutral rest zone registration was correct. Do not permit the patient to alter tooth arrangement by mandibular movement in any range. The only concern is with the position of the teeth in the neutral rest position.

6. With this neutral rest zone registration checked and any necessary changes made, the dentures are completed.

Functional Considerations

(Figs. 7 and 8)

Artificial dentures have been placed in the mouth to restore the key factor which remains normal in all cases; the nonfunctional neutral rest zone, in accordance with its upper, lower, anterior, and posterior limits.

Let us consider the functional aspect: The dentures act as "jacks" to support the mandible in a truly corrected position of restored centric muscular balance and restored centric occlusion when the teeth are closed at the upper limits of the rest zone.

The fact that the neutral rest zone has been restored to normal guarantees correct vertical dimension, and correct vertical dimension thus guarantees that the mandible cannot slip abnormally backward into the posterior region beyond the posterior limits of the neutral rest zone, nor upward abnormally into the region above its upper limits; hence, presuming this to be an abnormal case of upward and backward condylar thrust and joint trauma, the mandible would thus be repositioned downward and forward; likewise, the condyles would be repositioned downward and forward from their abnormal retruded position. This correction also stretches back to normal the muscle fibers which will respond quickly to balanced function and give the muscles of vertical closure their predominance over the muscles of lateral excursion, thus limiting abnormal lateral range of the mandible. (See First Installment, DENTAL DIGEST, February, 1941). It will, moreover, relieve the "piling up" of soft tissues against the eustachian tube.

Thus far, backward movement of

the mandible has been limited to normal restoration of the region beyond the posterior limits of the neutral zone to its function as a cushion. Its vertical movement has also been limited to normal. There remains to be considered, then, only the functional ranges of the mandible employed during mastication. These functional ranges of the mandible are, strictly speaking, combinations of anterior, vertical, and downward movements (which produce lateral excursion), originating in the neutral rest zone and returning to it. There is no posterior range normally. What about posterior movement of the jaw, then? Normally, there is none originating from the neutral rest zone. Jaw movement posteriorly takes place only after the mandible has moved into the anterior range; hence, jaw movement posteriorly originates at a point where anterior movement ceases in the anterior region beyond the anterior limits of the neutral rest zone and is terminated against the cushioned region at the posterior limits of the rest zone.

Technically, this stage of the description is comparable to an imaginary condition—a young person with a full complement of teeth that have not been "milled-in" by the processes of mastication. Thus, all that remains for the operator to do to complete the case is the procedure of accomplishing what Nature by processes of mastication does to the adolescent's natural teeth—carefully "mill-in," creating the small facets to accommodate excursive movement.

Correction has been accomplished by starting from a point that is common to the normal and abnormal cases alike. Chances of error seem to be minimized by this procedure.

By the time that it is necessary for a patient to lose his remaining teeth and to have them replaced with dentures, abnormality and deformity, to some degree, have usually been established. By starting from a point whose normality is questionable, such as retruded position of the condyles in the fossae, mandibular movement to secure a registration, bites taken under pressure that may record muscular unbalance in the wax, the operator begins in a zone in which all may be error. For this reason alone, his results may lead to a perpetuation of the abnormal.

*(To Be Concluded Next Month)
3720 Washington Boulevard.*

The Editor's Page

NOT SO MANY YEARS ago, writers of the fantastic fiction school predicted the day when man would take his foods from the air or from concentrates in the form of pills and vials. Although their prediction was primarily guided by a realization of the accelerated effort at economy of time, the idea that the human diet might need reinforcement or that all the life and health maintaining values might not be found in casual eating habits was suggested and sounded extreme. Now we know that food is more than the proteins, fats, and carbohydrates of twenty-five years ago. To these three essential factors there has been added the recognition of vitamins and minerals.

Vitamins have been defined as "small quantities of substances . . . essential to life." They are, according to Borsook,¹ characterized by (1) "the small amount of them which is necessary to preserve health" and (2) "the inability of the human body to make them." Vitamins must be supplied to the organism from without. At the present time there is a great deal of talk about reinforcing foods, particularly with the vitamin B complex. The National Research Council² and a subcommittee on nutrition, working with representatives of the milling interests, have plans now ready for the restoration of vitamins to white flour. The same committee has been active in planning the rations for the Army and Navy. Borsook believes that not only can the B complex be added to flour and sugar but that vitamin A can be added to the foods at the cannery and vitamin C to soft drinks at the bottling works. With the ability to synthesize vitamins on a commercial scale and to manufacture concentrates, Borsook sees no reason why anyone in the population should suffer from avitaminosis. It is his belief that a program of food fortification would cost about \$1.00 per person per year, although Harris, another investigator, estimates the cost to be \$1.80 per person per year. But whatever the cost the public should receive nutritional reinforcement. This nutritional planning has been called by a writer³ in *Harper's Magazine*, "biologic engineering."

When the importance of nutrition is discussed

in relation to total defense and public health, it should not be forgotten that a member of our own profession, Weston A. Price of Cleveland, was one of the first to point out that foods have qualitative as well as quantitative values. Price, in his significant book, *NUTRITION AND PHYSICAL DEGENERATION*,⁴ showed that the prevention and control of dental disease was not a matter of improving restorative techniques or surgical procedures or even in the seeking of a specific preventive drug. Price demonstrated that dental disease, arthritis, tuberculosis, fatigue states, episodes of nervous tension—all these were often the expression of malnutrition. It is more than ten years since Price, in the early days of the depression, tried to persuade the representatives of the Red Cross that flour for the recipients of relief should contain some of the wheat germ. It was Price, likewise, who recognized that the soil upon which foodstuffs grow to become nourishment for man and domestic animals has a qualitative characteristic. The products of the soil are luxuriant or dwarfed in direct proportion to the virility or the depletion of the soil and the degree of brightness of the sun. "The study of foods is more than a problem in domestic science; vitamins more than a recitation of an alphabet of A's and B's and C's. Geology, geography, degrees of latitude and longitude—these have an important relationship to man and his foods and the diseases that attack him."⁵

Not only do agricultural methods have to be reformed to improve the nutritional level of the American people as a contribution in itself to total defense but methods of marketing and distribution must be improved. Vegetables, for example, lose half their vitamin content through long exposure. Bad cooking accounts for heavy nutritional losses.

Thus it is seen that public health is more than battalions of dentists and physicians and nurses, more than hospitals and scientific equipment. Almost every phase of national life and the triad of economic life—production, distribution and consumption—are within the pattern of public health. The preparation of the country for total defense has at least this advantage: an awakened and quickened consciousness of the broader health needs of the population.

¹Borsook, Henry: *Vitamins: What They Are and How They Can Benefit You*. New York, The Viking Press, 1940.

²Larkey, S. V.: The National Research Council and Medical Preparedness, from *War Medicine*, J. A. M. A. 1:77 (January) 1941; Cushing, E. H.: The Health and Medical Committee, *ibid.*, pp. 66-68.

³Rorty, James: Total Defense and Public Health, *Harper's Magazine*, 182:375 (March) 1941.

⁴Price, W. A.: *Nutrition and Physical Degeneration*, New York, Paul B. Hoeber, Inc., 1939.

⁵The Dental Scene in *DENTAL DIGEST*, 39:163 (April) 1933.

Use of Face Bow and Gothic Arch Tracer in Immediate Denture Construction

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DIGEST

In immediate denture construction as well as in prosthesis for edentulous cases, the operator should begin by assuming that centric relationship is incorrect, and then proceed to obtain the correct centric registration. It is important to do this because centric relation as it is found in the patient is rarely true for the person but represents an adjustment to function. Accurate centric registration is essential because it is the most retruded point to which the condyles normally move in the glenoid fossae and the point from which all jaw excursions begin.

The truer centric relation is obtained by means of the Gothic arch tracer. The method of employing the tracing device is outlined step-by-step. The face-bow registration is likewise used and the face-bow transfer thus affords a double check on the accuracy of the centric relationship.

A case is reported and illustrated to exemplify the exact technique recommended.

THE ADVANTAGES OF immediate denture construction can be increased by the use of the face bow in obtaining proper positional relationship of the maxilla and through the use of the Gothic arch tracer which scientifically shows the true centric relationship, from

which all jaw movements begin. Pathologic mouth conditions leading up to the necessary extraction of teeth often markedly change the relationship of the condyles. This gives an incorrect bite registered on drifted, malposed teeth. This defect is registered by means of a squash-bite. The operator takes for granted that the bite is as correct as possible and encounters no difficulty because, as it was with the remaining drifted teeth, the condyles adjust themselves to impart function to the artificial denture. Inasmuch as the drifting of teeth caused the improper bite which to some extent necessitated the extractions, then, logically, to reproduce this bite in artificial dentures would lead to poor function, discomfort, instability and tissue disturbance. In immediate denture construction, the operator should begin by assuming that centric relationship is incorrect. With a scientific method to register centric relationship available, it is just as important to obtain this correct centric registration for immediate dentures as it is in edentulous cases.

It is doubtful, in my opinion, whether true centric relationship exists in any adult mouth even when there is present a complete complement of teeth which seem to function well. What does exist is an adjusted functional centric relationship. Lateral and protrusive interferences, as the teeth erupt, prevent the condyles from ideal centric functioning. If these interferences are pronounced, they may manifest themselves in glenoid fossae disturbances or necessitate periodontal procedures. When, however, the extraction of the mandibular or maxillary teeth, or both, is indicated, it is possible by means of the tracer, to approximate for the person a truer centric relation than that to which the patient was accustomed when in possession of his own teeth. The importance of obtaining centric relation is that it is the most retruded point to which the condyles normally move in the glenoid fossae

and the point from which all jaw excursions begin. Many prosthodontists set up immediate dentures on articulators having only a hinge movement to open and close the bite at will. But jaws do not perform as hinges; therefore, more adjustable articulators should be used and new tracings taken every time a bite level is changed.

The case I am reporting here was first completed by the old squash-bite method. When finished, it looked well but its function was only fair. My assumption was that the bite was incorrect, but as I had already completed an expensive gold lower case, I decided to change the bite by means of a tracing enabling me to adapt a new upper to the gold lower. Had I started the entire case by the tracer method, it would have been better and easier, because then I could have shifted both upper and lower teeth to conform to the graph.

Method of Employing Tracer

1. The tracing device should be arranged so that the remaining teeth do not interfere with the recording. As it is usually necessary to open the bite to eliminate either an anterior over-bite or to improve esthetics mutilated by a vertical dimension collapse, this procedure is not difficult to follow.

2. Wax bites made at this increased vertical dimension will clear the remaining teeth and eliminate interference in recording the graph. The tracer is attached to the wax bites and the tracing is made as if for an edentulous case.

3. The upper wax bite is built down below the level of the remaining upper teeth and the lower wax bite above the level of the remaining lower anteriors.

4. A practical tracing of this case is shown in Fig. 9 with a hole drilled at the apex of the Gothic arch. This hole, made on the lower platform wax, is at the point of centric registration and the tracing pin is fitted and locked into this hole to facilitate the

transfer of the upper wax bite and the lower gold partial case to the articulator.

For a Gothic arch tracing to be useful, at least one jaw member eventually must be made edentulous, unless a difficult bite-raising procedure is instituted. In this case, the Gothic arch tracing was used solely to transfer the upper wax bite and the lower finished gold case to the Hanau articulator in centric relation, which is a point of convergence of lateral and protrusive movements.

5. The sagittal condyle inclination paths are calculated on the articulator through the medium of a protrusive bite taken in the mouth on the waxed set-up, and through these calculations, by formula, the lateral base articulator paths are adjusted.

In the case cited here, inasmuch as the gold lower denture was to be unchanged, the bite was taken with the upper set-up biting protrusively into wax placed over the anterior teeth of the finished lower denture. Many dentists utilize the lateral paths on the graph to obtain the sagittal condyle readings on the articulator. If this procedure is followed, the articulator's condyle readings should coincide with those obtained by means of the protrusive bite wax used with my method of registration.

Report of the Case: Technique

Roentgenograms were taken and study models made. It was decided to remove all upper teeth and, in the lower jaw, to retain the left cuspid, right cuspid, right first and second bicuspids, and right third molar.

1. After the upper posteriors were extracted, a transitional claspless upper partial was used until healing took place. The lower anterior bridge and abutment teeth were then removed together with a few lower left posteriors. A crown cast in pontilay gold was made to cover the lower left cuspid. It was inserted over the tooth, but not cemented, because later it was to be porsonized. A lower impression was taken over this gold casting and the remainder of the jaw, and a transitional lower clasped case was made to coincide with the transitional claspless upper case. These cases were worn about three months.

2. The upper teeth were removed and the bone was trimmed, a celluloid matrix made from the upper cast having been utilized. At this stage two immediate upper acrylic



Fig. 1—Appearance after extraction of upper posteriors.



Fig. 2—Upper and lower transitional partial cases in place. Below the chin is one of the immediate acrylic resin uppers. A spare upper was also made at this time.



Fig. 3—Immediate upper in place directly after extractions and surgery.



Fig. 4—Re-lined upper in place against permanent gold lower. Cuspid has been porosized.



Fig. 5—Upper and lower cases shown outside the mouth.

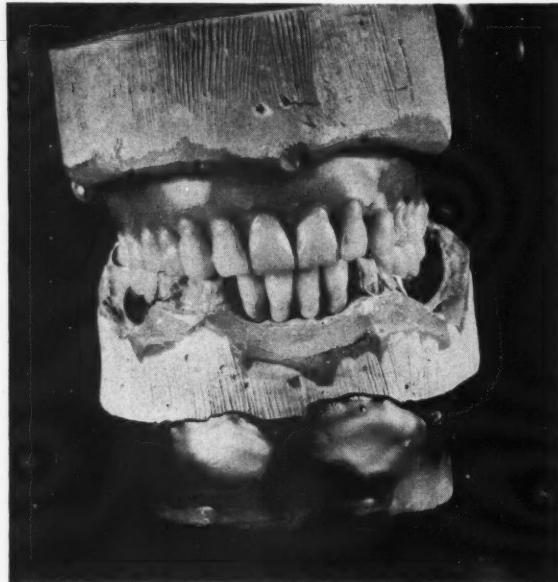


Fig. 6—Arbitrary set-up made prior to face-bow transfer and Gothic arch tracing. Extra face-bow wax bite below articulator.

resin cases were made. One was inserted and the other set aside as a spare case.

3. After an interval of two months, the lower left pontilay gold crown was faced with porcelain and cemented in place. A new lower impression was taken after which re-line paste was inserted in one of the immediate transitional upper dentures and a new bite was taken.

4. A new upper denture was made with the use of the re-line impression, and a new permanent gold lower denture was finished. The resultant function with these cases in place was only fair and it was decided to improve the functional result by the use of the tracer.

5. The teeth were now removed from the original spare upper case. With a wax bite, I obtained a squash-



Fig. 7—Tracer approximated on articulator for convenience, after which upper cast was transferred to articulator.

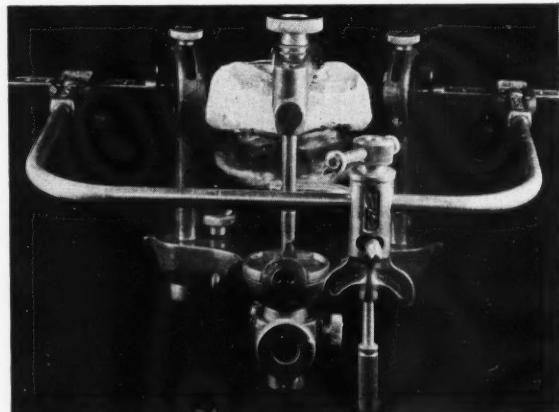


Fig. 8—Face-bow transfer of upper model to articulator.

bite against the permanent lower gold case. An arbitrary set-up to check esthetics was made on an ordinary articulator with the teeth from the upper spare case.

6. For convenience, another upper wax bite was used; the tracing device was aligned on this ordinary articulator. The lower tracer platform was waxed to the permanent gold lower denture.

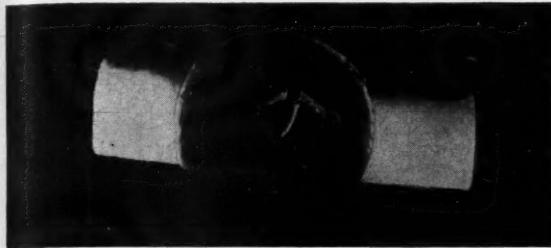


Fig. 9—A Gothic arch tracing. The hole drilled at the apex designates centric registration. The lines on each side going sidewise are right and left lateral markings. These lines are usually of different lengths. The other line going down from centric is the protrusive registration which is usually curved.

7. Another upper wax bite was then used to obtain a face-bow transfer for mounting the upper model on the articulator.

8. The Gothic arch tracing was taken and the lower model carrying the gold permanent denture was set against the upper model already positioned on the articulator by means of the face-bow transfer.

9. A new set-up was made on the articulator according to this Gothic arch tracing, and the centric registration, obtained through the graph recording, was checked by placing the set-up in the mouth and taking a squash bite.

10. The new set-up was placed in the mouth. A protrusive wax register was then taken in the mouth to the extent of one-eighth inch.

11. The permanent lower gold denture was at this time securely waxed to the lower cast on the articulator. Over the anterior teeth of this gold lower, the protrusive wax bite was also firmly secured. The upper set-up was securely waxed on the articulator to its cast.

12. Each sagittal condyle path was adjusted on the articulator accordingly, just as the upper set-up teeth were made to fit into the protrusive wax bite.

13. The lateral base adjustments were made on the articulator by an arbitrary formula.

14. The upper posterior teeth were reset according to the new sagittal

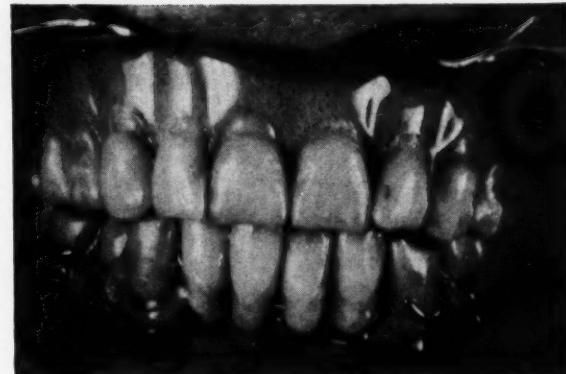


Fig. 10—View of completed cases made according to face-bow and tracer centric registrations. Note shaping and staining of teeth, particularly at gingival and compare with Fig. 1.

condyle paths and the lateral articulator adjustments were obtained. If this case had been originally started by taking a graph instead of a squash bite, the lower teeth could have been moved likewise, but as previously stated, I did not wish to remake the completed gold lower case.

15. The new upper acrylic resin case was processed to completion and together with the gold lower placed in the mouth. The dentures were worn for a week and then placed back on the articulator and ground into occlusion.

252 West Seventy-Ninth Street.

Divinyl Ether: A Suitable Agent for War Surgery

(Continued from page 165)

cc. will not produce profound anesthesia for more than a few minutes in the average adult, whereas it may produce a light anesthesia for longer than a half hour. Should a considerably larger quantity of vinethene be used and a profound anesthesia is

extended to the half hour limit, a considerably greater degree of depression than is safe may occur within half an hour. The following limits are therefore suggested: (1) for profound or deep anesthesia, not more than 50 cc. of vinethene; (2) for mod-

rate anesthesia, neither more than 75 cc. of vinethene nor more than half an hour (whichever is less); (3) for slight anesthesia, not more than 50 cc. of vinethene without regard to the half hour limit.

1832 Eye Street, N. W.

In your ORAL HYGIENE this month



Maybe he's your grandson!

Anyway, he's a dentist of the year 2041—according to the conception of Mel Steinfels, ORAL HYGIENE artist, who drew the picture to illustrate Dr. Leonard C. Borland's "Journal of a Dentist of 2041" in April ORAL HYGIENE.

The leading article this month is based on an interview with Dr. Harrison J. Mullett, dentist to General Chiang Kai-shek, and Doctor Mullett's colleague, Dr. R. Gordon Agnew. The title: "Dental Pioneers Return from China." Don't miss this!

This month, too, Dr. Harvey J. Burkhardt tells how "War Affects Eastman Dental Clinics in Europe."

"Between Bombs, Dentists Carry On" in wartime Great Britain, according to Dr. Edward Samson, British dentist, who colorfully de-

scribes dental life in his country.

"I'm Going to be Better to My Patients," says Dr. William Raskin, and tells how in this unusual article on practice-building.

Then there's the new department, "Military and Defense News," as it relates to dentistry. This month's editorial deals bluntly with "Today's Dental Paradox," a problem intimately affecting innumerable dentists. "Dentists in the News" tells of seven who have been in the papers. Five pages are devoted to the "Ask ORAL HYGIENE" department this month, and there's another chapter of the department's new "annex," presenting the "Technique of the Month." And, for "the pause that refreshes," the popular "Laf-fodontia."

In your April ORAL HYGIENE

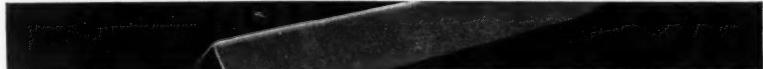
NOTES ON THE

Cuff

No Guarantees for the Living . . .

Along about this time of the year when the ground is good and gooey, the season for studying the garden catalog is at hand and trips to the nursery are frequent. After I bought some young fruit trees and had them neatly balled and wrapped in burlap, I noticed this sign in the nursery man's warehouse: "We do not guarantee our merchandise after it leaves this place." Now, you will see that that is no guarantee at all, and that is what I said to the merchant. I asked him why, if he did not want to guarantee his goods, he made any mention of it. His answer was that he wanted to point out to dumb people, and I am sure he put me in this category, that growing things could not be guaranteed. He could not know what was going on in the root system or the cambium layer or any other living parts of nursery products. He could not know, moreover, what kind of soil the trees would be placed in nor did he know what method would be used in their planting. And he had no way of knowing by the cut of the customer's head what energy in the way of feeding and watering the trees, the new owner would expend.

This nursery man knew more about the behavior of living things than most of us dentists do. Sometimes we are too quick to guarantee some of our services and some of the restorations that we place. We certainly have no way of anticipating what will go on in the tissues upon which we operate or upon which we build. The success or failure of our efforts are altered by tides in the affairs of metabolism over which we have no control. We do not know any more than the nursery man does about the kind of soil upon which we are placing our restorations nor can we foretell the kind of care they will receive after they are once placed in position in the oral tissues. So, the next time we are asked how long we guarantee



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When a cheerful
"Hello Doctor"
is a vote of
CONFIDENCE

The confident, cooperative young patient is both a credit and an asset to his dentist. His cheerful "Hello Doctor" is a tribute of confidence that must be earned. It can not be bargained for. His attitude toward his dentist and toward dentistry reflects his experience in the dental chair. When confidence has been established by the control of fear and apprehension during these formative years, it is likely to remain throughout adult life.

For over thirty years McKesson nitrous oxide equipment has been making dental treatment easier for both the young and the adult patient—and easier for the dentist. The Nargraf for *both anesthesia and analgesia*, and the Easor for *analgesia only* are the result of over thirty years of research, engineering experience, and intimate study of the operator's problems. You can make no more profitable investment in office improvement than the purchase of a McKesson gas machine. Let us tell you what these machines are doing for other dentists. Return the coupon on page 186.

McKESSON APPLIANCE CO.

Toledo, Ohio

our "work" to last, we might remember the nursery man's sign.

"Flute Players" . . .

Plato says in one of the dialogues with Protagoras something to the effect that even though a man be a good flute player, this is no reason to consider him an authority on politics—or, I may add, to stretch the point, on anything else. This looking for counsel and direction in all fields to one who has excelled in any field seems to be particularly an American proclivity, for, as Hans Zinsser specifies the observation in *As I REMEMBER HIM*, Gene Tunney and Col. Lindbergh, having achieved renown in the worlds of prize fighting and aviation, become authorities on foreign policy.

This unthinking audacity in going outside one's field of knowledge and usefulness in attempting to influence opinion and activity is not confined to the hero-worshipped; it is likewise a propensity of publications. *Printers' Ink* which does a good job of expressing the point of view of the business man, particularly the one engaged in advertising in any of its branches, makes the absurd detour from its own province into the realm of dentistry, about which it knows as much as *The DENTAL DIGEST* knows about astronomy. In commenting on a dentist who gave nicknacks to children in order to build up dental good will, *Printers' Ink* tells the ridiculous and unsound story of "A Toy for a Tooth." Here it is in part:

"At his exhibit space, the doctor displayed an array of suggested gift articles . . . The doctor prefers to call them 'souvenirs.' Realists in the merchandising world would use a more descriptive term. They are premiums, pure and simple.

"And why not? Barbers have given lollipops to youthful customers for years. The dentist, whose nerve-wracking [sic] drill is rather more terrifying than the barber's clippers, could do with a bit of merchandising strategy.

"The idea is, moreover, equally adaptable to the grown-up trade. It takes no door-to-door survey to establish that the percentage of adults who cherish a trip to the dentist's is small.

"Serial premiums might be especially good. With each tooth pulled, an iced-tea spoon and in twelve ses-



● You get $\frac{1}{2}$ ounce of Ames Plastic Porcelain Powder for \$2.00 and 14 cc of Ames Plastic Porcelain Liquid for \$1.00. Available in 12 colors. It conforms to A.D.A. Specification No. 9 for Silicate Cements. No need to buy items not wanted in order to enjoy the use of a filling porcelain that brings many exclusive, valuable clinical advantages. Give this new plastic porcelain a trial. Ask your dealer or write The W. V-B. Ames Company, Fremont, Ohio.



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Thousands of the most successful dentists have found gentle Prophylaxis with BS POLISHERS a short-cut to regular, profitable practice . . . because it is performed practically without the discomfort or pain that keeps so many patients away from the dentist's chair.

This GENTLER Prophylaxis is possible because BS POLISHERS are smaller and shorter . . . because they have no exposed metal parts turning in the patient's mouth . . . because they run cool and smooth . . . because they do not throw or splatter abrasive. Send for a free sample and try it yourself.

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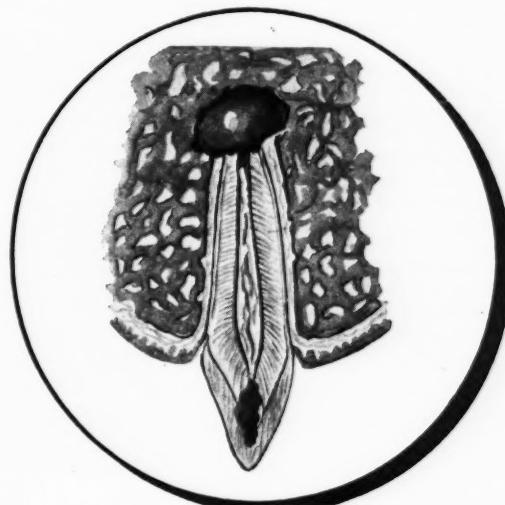
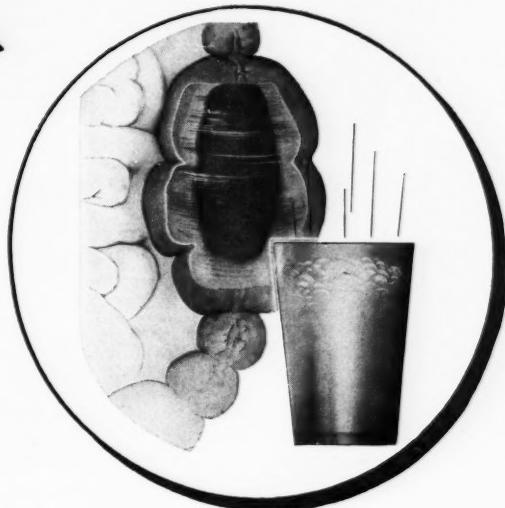
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*Helps Guard Against
Systemic Invasion*

Among the oral conditions which frequently lead to systemic invasion are periapical infection, pyorrhea, retained root fragments and Vincent's angina. Routine use of Sal Hepatica in these and other dental cases helps retard wide-spread infection by effectively cleansing the intestinal tract of harmful waste. The *liquid bulk* supplied by Sal Hepatica plus water gently stimulates peristaltic movement and flushes the bowels.

Sal Hepatica, in addition, aids digestive function by combating excessive gastric acidity and by stimulating the flow of bile. Send for trial supplies of Sal Hepatica.



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Low (850 to 900 degrees) and Medium (1200 to 1400 degrees) are for casting work. High (1900 to 2000 degrees) is for low fusing porcelain.

Under uncontrolled, excessive heat, casting investments tend to liberate corrosive gases, which attack the gold, and roughen your castings. But, with your temperatures, Kerr-Furnace-controlled, your investment will stand up indefinitely, even under prolonged heat.

Smoother, better castings, and the elimination of make-overs, are the uniform result.

KERR DENTAL MFG. CO.
DETROIT

- Painstaking insulation cuts heat losses to negligible... Costs less than two cents an inlay to operate...
- Accommodates up to three casting rings...
- Comes complete with 6 tongs and an extra oversize, long-lived heating element...
- A high quality furnace at a surprisingly low price... Ask your dealer.



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sions you have a complete set. Something is to be said also for the related utility premium favored by many commercial merchandisers. As the flour advertiser proffers an oven thermometer, the dentist could tempt trade with a foam-rubber swooning mat for use when the bill arrives."

Perhaps we are giving this bit of nonsense more consideration than it deserves. But let us consider it nevertheless because of the opportunities it affords to stress a few concepts and point a few differences between the professions and business: Just visualize this exhibit space with the coy "little-girl trinkets." Is the dental office to be a Woolworth's souvenir counter or a shooting gallery prize shelf? And dentists are to give trinkets away because barbers give lolly-pops. Dentists are to take their cue from barbers when medicine as a whole has only lately emerged from the chirurgeon-barber days, and dentistry, having torn away from the gold-tooth dental parlor is to enter the tearoom with spoon premiums. Such patronage bait would no doubt make patients clamor for the dental drill! As for furnishing a swooning mat when the bill arrives—this is the only clue that perhaps, as it is hoped, *Printers' Ink* began to see the absurdity of the suggestion and stuck its tongue in its cheek. The professions cannot be treated with the methods of business. Patients must come to the dental office because they have been educated by their dentists to the health necessity of caring for their teeth. Patients need not swoon when they receive their bills, because in well conducted practices there is always an understanding as to costs.

Philatelists Attention! . . .

Doctor Bert B. Otto of 28 Shore

Lane, Bay Shore, New York, is making a collection of American Dental Association Relief stamps. One would think that with the thousands of these stamps distributed through the years there would be a complete file available. From the inception of the stamp idea in 1913 down to the present there has been an issue each year, but no one seems to have a complete album of all the stamps. Doctor Otto is trying to acquire such a collection which he plans when completed to present to the American Dental Association library. Anyone who has some of the older stamps, especially of the years before 1929, will be doing Doctor Otto and the American Dental Association a favor by speaking up.

The Heart of Medicine . . .

Harvey Cushing was unquestionably one of the most skillful neurologic surgeons who ever held a scalpel; but Harvey Cushing was a great deal more than that. He never forgot that medicine has a heart and that humanism is as important as science. In his last book, *THE MEDICAL CAREER AND OTHER PAPERS*, Cushing had this to say about the heart of medicine:

"Three fifths of the practice of medicine depends on common sense, a knowledge of people and of human reactions. More than half of the remainder is technological and mechanical, the work of those medically trained artisans we call surgeons. What remains may be termed preventive; and this in bulk very properly and inevitably comes to be taken over by the state, though people, being what they are, find ways of evading a disagreeable statute as in the case of compulsory vaccination—intended for others but not themselves. Not everybody obeys the traffic light, and every regulation breeds its jaywalkers and its racketeers."

Cushing was a spiritual kin to Hippocrates. Although this phenomenal Greek lived more than 2000 years ago, he enunciated practically every principle upon which modern medicine is based. Recently I confided to a friend that among the great experiences I could wish for would be the reading of an original manuscript by Hippocrates—to feel the closeness with the expressions of that magnificent mind without losing any of its flavor, as much of it must be lost in the course of translations, however faithful. Hippocrates might well have been

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BITE-WING (1-film packets)— $1\frac{5}{8}'' \times 1\frac{1}{8}''$, $1\frac{5}{8}'' \times 1\frac{1}{4}''$, $2\frac{1}{8}'' \times 1\frac{1}{4}''$, $1\frac{3}{8}'' \times \frac{7}{8}''$.

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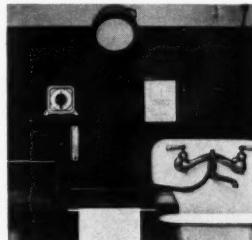
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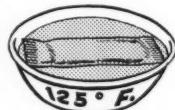
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thinking of dental disease when he said, "Every late case was at one time an early one."

Every time we see a denture, every time we see far advanced periodontal disease, rampant caries, we should remember that one day that late case was an early one. Someone failed along the line; someone was careless; someone put off. We have no control over the behavior of people in these situations, except by the methods of education. But we do have a measure of control over our own carelessness. Many of the late cases, fairly well advanced in dental disease, which I see today are that way because I was neglectful. I have had people under observation through the years and they have developed extensive caries that I did not detect. Why? Probably because I did not use the x-ray apparatus as much as I should have, perhaps because I was too casual, too hurried; because I took too much for granted. And every dentist must admit that he has along the line forgotten the heart of medicine and has had confronting him such late cases which were once early ones.

I have had mouths under observation for years in which the teeth literally melted away from erosion. In such cases I did nothing about it because I knew nothing to do. And in this experience, every dentist must share my humiliation. I have prolonged many cases of periodontal disease, however unintentionally, but have cured few. I have used all the lauded medicaments, the various vaunted operative procedures, many of the fancy tools—but somehow the disease, even after periods of improvement, has recurred. And so I grow weary of the spectacular successes constantly reported and would welcome a clinic on failures. For my part, I have under preparation a paper, **WHAT I DON'T KNOW ABOUT DENTISTRY**. Anyone from among the profession who shares this awareness of ignorance and limitations in many phases of practice is invited to contribute to this paper his every-day attempts at treatment in which he fails.—E. J. R.

THE DENTAL DIGEST has no special subscription representative in Hawaii. Dentists are urged to enter their orders only through dental dealers.

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LESS THAN ANY
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(Please use coupon on page 187)

The Management of Cardiac Patients Who Require Major Surgery

(Continued from page 162)

the tongue every half hour preoperatively and, if a local anesthesia is used, during the operation as well, may be beneficial.

Prevention of Complications

The incidence of complications may be reduced by the following measures: (1) avoiding the administration of unduly large amounts of fluids postoperatively or of unnecessarily large doses of sedatives; (2) removing bronchial secretions with a catheter or the use of postural drainage in certain cases; (3) frequent changing of the patient's position; (4) encouraging deep breathing; (5) avoiding tight abdominal binders or distention; (6) the guarded use of drugs which may produce ill effects, such as morphine, extracts of the posterior lobe of the pituitary gland, carbon dioxide mixtures, atropine sulfate, adrenalin, cocaine and novocain. The last two drugs when applied to the upper respiratory passages may cause the inception of collapse or of cardiac arrhythmias, and at times of ventricular fibrillation and death. (7) Paredrine and other sympathomimetic drugs may be beneficial in the course of spinal anesthesia in preventing hypotension and restoring the blood pressure to normal levels.

DENTAL MEETING

Dates

Dallas Mid-Winter Dental Clinic,
Hotel Adolphus, Dallas, Texas, April
21-23.

Louisiana State Dental Society, six-
ty-first annual meeting, Hotel Roose-
velt, New Orleans, May 1-3.

Cleveland Dental Society, annual
Spring meeting, Statler Hotel, Cleve-
land, May 5-7.

(Continued on page 188)

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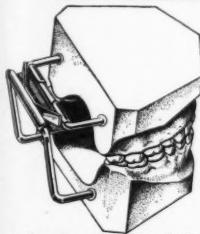


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The easy way to make neat study models

Just pour plaster or stone into rubber model base former and mount anatomical cast. Upper and lower models made in these formers occlude automatically. Complete illustrated directions supplied.

Price per set—1 upper and 1 lower rubber model former..... \$2.75



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THE New Columbia Study Model Articulator has a spring attachment which makes possible lateral and protrusive mandibular movements, and also permits the articulated casts to be easily separated and assembled again.

To mount models, drill the four holes (template and drill supplied) and attach prongs with sticky wax. To remove articulator from cast merely heat prongs and withdraw. Casts remain unmarred.

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See pages 188-189

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I understand I may return unused material for credit if not satisfactory.

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Please send free "Vision" booklet.

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Dental Digest Binders \$1.50 each



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DEALER

See page 183

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THE DENTAL DIGEST

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DENTAL MEETING DATES

(Continued from page 184)

New Jersey State Dental Association, annual meeting, Berkeley, Carteret Hotel, Asbury Park, May 7-9.

Tennessee State Dental Association, seventy-fourth annual meeting, Hotel Andrew Johnson, Knoxville, May 12-15.

Illinois State Dental Society, seventy-seventh annual meeting, Pere Marquette Hotel, Peoria, May 12-15.

The Dental Society of the State of New York, annual meeting, Hotel Statler, Buffalo, May 13-16.

Georgia State Dental Association, seventy-third annual meeting, Hotel DeSoto, Savannah, May 19-21.

Ontario Dental Association, seventy-fourth annual meeting, Royal York Hotel, Toronto, May 19-21.

The Alumni Society of the Philadelphia Dental School, seventy-eighth annual session, Temple University School of Dentistry, May 21-22.

Western Reserve Dental Alumni Association, annual meeting, School of Dentistry, Cleveland, June 9.

Pennsylvania State Dental Society, seventy-third annual meeting, Bedford Springs Hotel, Bedford, June 3-5.

Association of French Speaking Dentists of North America, annual meeting, Chateau Frontenac Hotel, Quebec, Canada, June 5-7.

South Dakota State Dental Society, fifty-ninth annual meeting, Alex Johnson Hotel, Rapid City, June 15-17.

Mississippi State Dental Association, annual meeting, Buena Vista Hotel, Biloxi, June 9-11.

Northeastern Dental Society, twenty-seventh annual convention, New Ocean House, Swampscott, Massachusetts, June 8-11.



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Montreal Dental Club, seventeenth annual fall clinic, Mount Royal Hotel, Montreal, September 24-26.

Odontological Society of Western Pennsylvania, annual meeting, William Penn Hotel, Pittsburgh, November 11-13.

Florida State Board of Dental Examiners, regular meeting, Jackson-

ville, June 23-27. Applications must be filed by April 23. For information write to Doctor H. B. Pattishall, 351 St. James Building, Jacksonville.

Ohio State Board of Dental Examiners, regular meeting, Ohio State University, College of Dentistry, the week of June 23. For information write to Doctor M. H. Jones, 1553½ North Fourth Street, Columbus.

California State Board of Dental Examiners, regular meeting, Physicians & Surgeons College of Dentistry,



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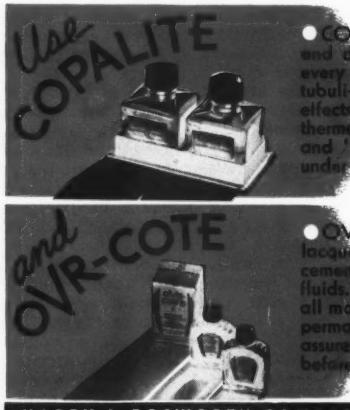
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